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Non-Communicable Disease and Associated Risk Factors among Social Groups in India

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Abstract: The study examined prevalence of non- communicable diseases (NCDs) in states/UTs, across the social group and associated risk factors in India. The study used 71st round of NSS data. Diseases prevalence is calculated in proportion to ailed person (PAP) per 1000. Risk factor is modeled on logit regression and adjusted on states. In 2014, PAP was 63/1000 with very high in Kerala (292/1000), Andhra Pradesh and Tamil Nadu to West Bengal and Punjab in North. Lowest PAP in found in North eastern states. PAP varied between (78/1000) among *Others* to 28/1000 among ST. Aged people have the highest prevalence of NCDs (294/1000). Close to 46 percent of total NCDs is contributed by Hypertension, Diabetes, Cardio-vascular and respiratory diseases. Result from logit regression revealed Others having highest odds ratio (OR) of NCDs. Significantly, aged, uneducated, poor, engaged in casual labour and non-Hindu extracted on high OR State contributes significantly in reducing the risk of NCDs in the country. National and state level policies should focus on aged, marginalized and underdeveloped to reduce the risk and combat NCDs where increasing aged people and poorly developed social groups are challenge for the equality and development.

Keywords: Aged, Caste, Non-communicable diseases, Ailed person, State.

Introduction

With demographic and epidemiological transition, the disease burden has shifted from communicable diseases (CDs) to non-communicable diseases (NCDs) globally. This shift has changed health and longevity globally as the shifting in mortality has risen due to non-communicable diseases. This shift reiterates Omran's theory of epidemiologic transition postulating complex pattern of health and diseases, and their change and interaction and consequences along the demographic, economic and sociologic determinants (Omran, 2001). With medical intervention and development of vaccination, antibiotics and improvement of life conditions after the Second World War, non-communicable diseases (NCDs) started causing major problems in industrialized countries and further in developing counties. Omran's theory also explains changing disease patterns over time predominantly from infectious to chronic non-communicable diseases (NCDs). By 2020, it is predicted that NCDs will account for 80 percent of the global burden of disease, causing seven out of every 10 deaths in developing countries, compared with less than half today (WHO, 2003.) Then, by the dawn of the third millennium, NCDs appeared sweeping the entire globe, with an increasing trend in developing countries where, the transition imposes more constraints to deal with the double burden of infective and non-infective diseases in a poor environment characterized by ill-health systems along with associated economic and sociological changes.

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Among the NCDs; Heart diseases, cancer, diabetes, chronic pulmonary and mental diseases became a real burden for health systems in developed countries. For a while, these diseases were associated with economic development and were considered diseases of the rich. The diseases are like cardiovascular diseases, cancers, chronic respiratory diseases and diabetes play a big role in mortality (WHO, 2013). Cardiovascular, diabetes and cancer play a big role in India and first two diseases are responsible for 27 percent and 9 percent respectively death respectively (Engelau et al., 2011; WHO, 2015). The latest WHO report on global status of Health in 2019 revealed that overall shortage of services within and outside the health system to prevent and treat NCDs will increase the risk because currently two in three deaths in India are happening due to NCDs. In Indian scenario, where life expectancy has increased close to 70 years, Indians lose a decade of healthy life to non-communicable diseases like diabetes, cancers, and heart and lung diseases (WHO, 2020). A study by Boutayeb and Boutayeb (2005) stated that in 1990, out of total 39.5 million diseased person in developing counties, 47 percent were contributed by NCDs which increased to 56 percent (of total 45 million) and will increase to 69 percent (of total 53 million) by 2020. This feature is already evident in low income, developing countries in rapid developmental transition such as China, India and Brazil (Habib and Saha, 2010).

The scenarios of NCDs are representing the global and economically low- and middle-income countries are victims of this NCDs epidemic or wrathful. This health and mortality transition entails fall in infectious disease mortality and a rise in chronic NCDs. The SDGs goal for non-communicable disease is very difficult to achieve by 2030, without make progress in control on chronic and NCDs increasing continuing (NHP, 2019). Disease rates from these conditions are accelerating globally, advancing across regions and social classes (Habib and Saha, 2010). In India, along the social class all are not equally developed as poor developed social class/group having high incidences of morbidity and mortality. But, how the non-communicable diseases are contributing to morbidity pattern among such Indian social class in not much studied. Socioeconomic and demographic factors have been shown to be significantly associated with an increased risk of NCDs. Among them in India is social class identity affiliated with caste having great influence on group specific progress and development (Raushan and Mutharayappa, 2014). A recent study by Raushan and Prasad (2017) found that poor developed social group like SC and ST are still facing the threat of communicable diseases but there is variation along different indicators of socio-economic and demographic development. Hence, it is important to understand the prevalence of NCDs across the social groups in India and associated risk factors to propagate the programme and strategy to combat NCDs and achieve the goal of SDGs fixed for 2030.

In the prevailing situation of rising NCDs, the present study is a modest attempt to examine prevalence of NCDs and share in total NCDs burden across the social group and associated risk factors in India. The study has its specific objectives to examine levels of NCDs by selected socio-economic and demographic characteristics among each social group. Second, share of each non-communicable disease within the total population suffering from non-communicable diseases among each social group. Third, identify significant demographic and socioeconomic risk factors for NCDs in India, and relative risk of each NCD among social groups.

Material and Methods

The study used social consumption on health (SCH) data of 71st round of National Sample Survey collected by government of India in 2014. The data provide information on various morbidities, treatment seeking behavior, expenditure on treatment and associated factors for whole country. The information on health services utilization for treatment of disease and expenditure incurred by households is provided for two time periods: one for the last 365 days and another for the last 15 days preceding the survey. Another important feature of the data is reasons for not seeking treatment. Third, it also provides details regarding the type of morbidities ranging from communicable to non-communicable, injury/accident and child birth and maternal health related. Overall, a total of 65,932 household carrying 333104 persons were surveyed during 71st round in 2014 (MoSPI, 2016). The sampling design and other details are available with report on NSS report no-574 on Health in India and can be understand better way. However, the study is based on self-reported morbidity by the household members during last 15 days preceding the survey.

Classification of Disease

The NSS provided information on 61 different types of illnesses. These 61 types of illnesses are categorized within 15 broad groups (including child birth). However, for the purpose, only non-communicable diseases (NCDs) have been included here. It is based on WHO classification of disease using of 10th revision of International Classification of disease (ICD-10) and Government of India report on the causes of death, 2015. The list based on ICD-10 comprises 20 major group, 69 categories and 93 sub-categories. In the study, we have categorized the reported NCDs in 14 broad categories using on NSS schedule. This can be found in table A1 in detail. The details definition, symptoms and other characteristics of each ailment can be found in report on Health in India, 2016[3] (MoSPI, 2016).

Analytical Framework

The study focused on to examine demographic and socio-economic risk factor and state effect on Non-communicable diseases among social class/groups in India. Social class is grouping of caste in four broader categories- Scheduled caste (SC), Scheduled Tribe (ST), Other Backward Classes (OBC) and *Others* as mentioned by households at the time of survey. So, we have included age (0-14/15-29/30-44/45-59/60 & above) and above sex (male/female) within the demographic characteristics. Within the socio-economic characteristics- place of residence (rural/urban), members educational status (no education/primary/secondary/higher secondary/ graduate & above), household religion (Hindu/Muslim/Christian/Rest) is considered. Economic status is one of the important indicators and for this we have included monthly per capita expenditure (MPCE) quintile and main income source for households. Using the monthly per capita expenditure, we have categorized into five equal quintiles as has used widely in health studies across the globe. Main household occupation is considered as main income source and it has been categorized as: self-employed in agriculture, self-employed in non-agriculture, wage/salaried worker, casual labour in agriculture, casual labour in non-agriculture and else used other type of occupation can't be fitted into the mentioned categories.

[3] NSSO Report No-574: Health in India, NSS 71st Round: 2014. Chapter-2, page no: 16-22.

The prevalence rate of each NCD is calculated using proportion of ailed person (PAP). PAP is defined as the number of person(s) ever diagnosed with any of the non-communicable disease per 1000 population in last 15 days prior the survey. Social class/group comparisons were performed using bivariate methods on demographic and socioeconomic characteristics. Share of each NCD in total NCD is calculated on the persons who had reported at least one of the NCD ailments at the time of survey. We have also calculated state level NCD prevalence for each social group. Further, prevalence of each non-communicable disease or disease group is calculated for each social group. Finally, logistic regression analysis was conducted to identify demographic and socioeconomic predictors of the NCD and the result presented in the form of the odds ratio (OR). The odds ratios were estimated using two models: Model 1 is controlled on demographic and socio-economic characteristics and Model 2 adjusted on state to examine state level effect on risk of NCDs. The logic behind adjusting the model controlled on the states/UTs for the reason that all the states/UTs are not equally developed on availability of health infrastructure and human resources will contribute in altering healthcare delivery the curative and promotive healthcare which may propagate the risk of NCDs (Duran and Khot, 2011; Panda, Mahapatra and Persai, 2018). In the bivariate analysis, multiplier is applied for the representativeness. All the analysis is conducted using STATA 14 statistical software packages (Stata Corp, 2014).

Results

Proportion of Ailed Person and their Social Distribution

The proportion of ailed person by age and sex across the social groups is provided into Table 1A. In India, proportion of ailed person (PAP) for non-communicable diseases (NCDs) in last 15 days preceding the survey is found 63 per 1000 in 2014. At the regional level across the states (Map 1), the PAP is found highest in Kerala (292/1000) followed by Followed by Andhra Pradesh (164/1000) and Tamil Nadu (129/1000). In North India it was in West Bengal (110/1000) and Punjab (101/1000). The lowest PAP was found in north-eastern states and lowest of only 5 persons per 1000 in Manipur. Nagaland and Meghalaya are found having PAP below 10 per 1000. There are 12 states/UTs where PAP is more than national average. Within the states/UTs across the social group, the prevalence of ailment can also be understood from Table A1.

Across the social groups, it varied from a low of 28 per 1000 among ST to high of 78 per 1000 among *Others* group. Along the gender more female than male had reported for any NCDs, the PAP is 75 per 1000 among female and 51 per 1000 among male. It is lowest among ST followed by SC and high among *Others* group. Another important observation is that, the male-female difference on PAP is very low, only two among ST, but more than 20 (varied between 24 and 28 per 1000) among non-ST. Like among ST, male and female PAP is found 27/1000 and 29 per 1000 which in 65/1000 and 92/1000 among *Others* group.

Map 1: State Level Prevalence Rate of NCD in India (per 1000)

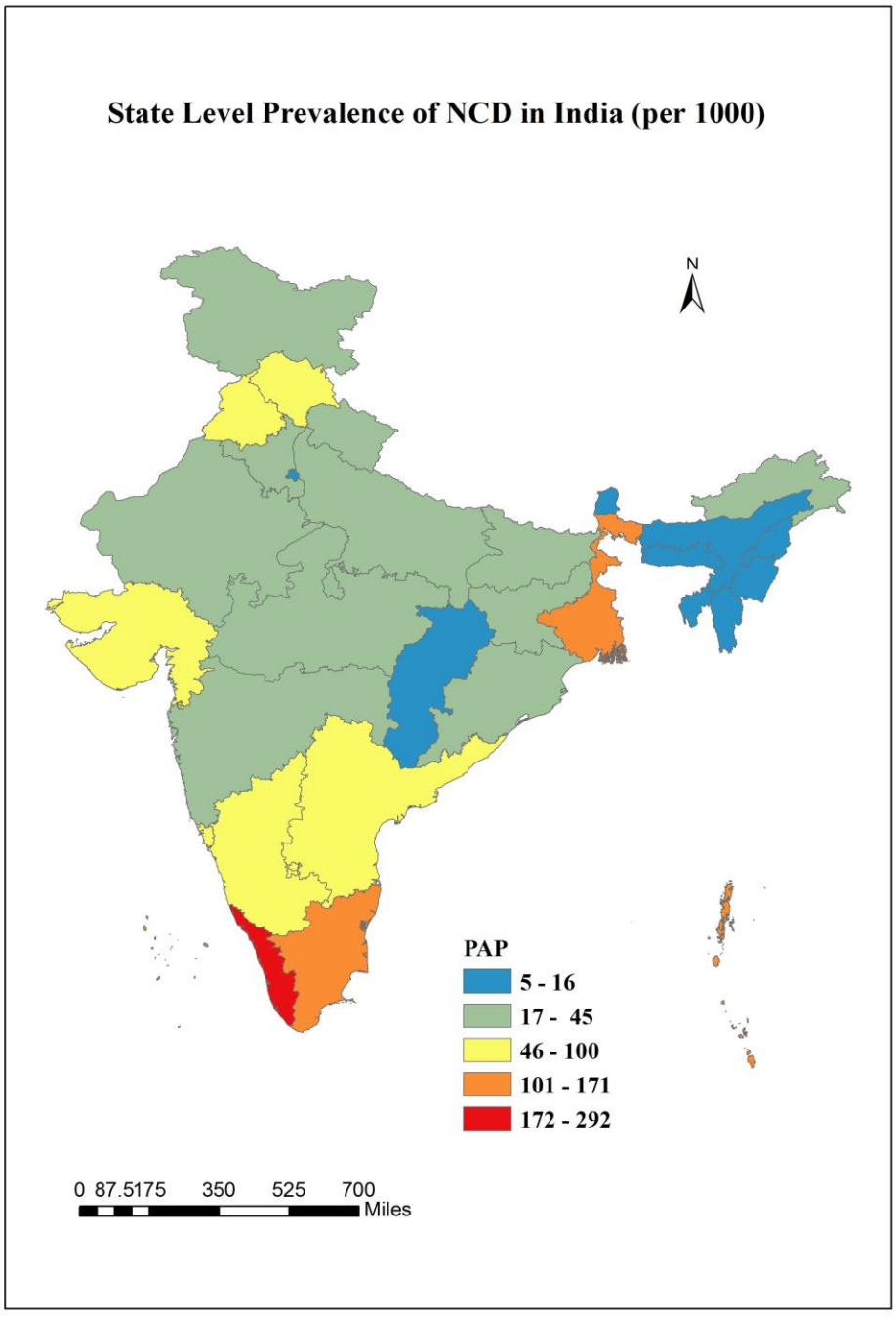


Table 1A: Proportion of Ailed Person for Chronic Ailment by Age and Sex across Social Groups in India (per 1000)

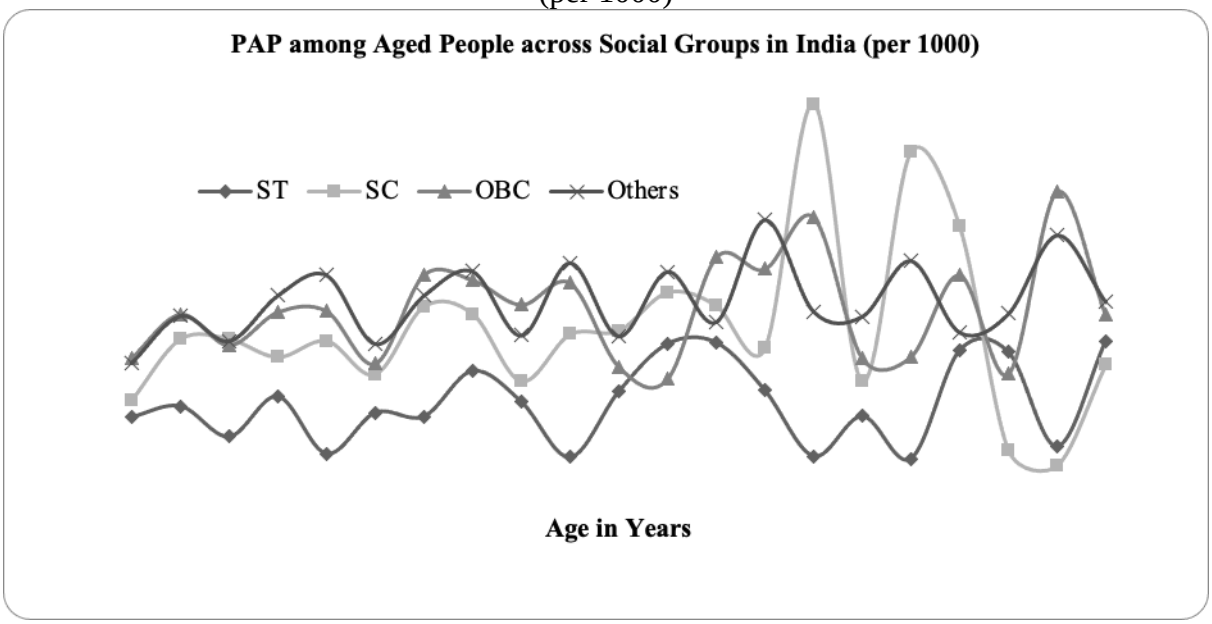
	Social Group				India
	ST	**SC**	**OBC**	**Others**	
Sex					
Male	26.8	41.6	51.5	65.3	51.2
Female	29.3	70.3	75.5	91.7	74.6
Age Group					
0-14	8.2	10.4	10.7	13.8	11.1
15-29	9.3	23.8	19.4	18.0	18.9
30-44	25.7	56.0	60.4	57.6	55.6
45-59	63.6	126.3	132.6	154.0	132.3
60 & Above	140.1	253.4	302.3	337.7	294.1
All	**28.0**	**55.5**	**63.2**	**78.0**	**62.6**

Source: Authors' calculation using NSS data on Social Consumption on Health, 2014

Age pattern of NCDs shows increase with increasing age and a very high among the aged people. The proportion increases with only 11 persons per 1000 within 0-14 years children to 56 per 1000 within 30-44 years persons to a very high of 294 per 1000 among persons of age 60 years and above. Across the social groups, same pattern is observed, although there is variation across age. Like, within 0-14 year age group, only 8 children per 1000 among ST have reported for any NCDs which is 11 per 1000 among OBC and 14 per 1000 among *Others* group children. Within 15-29 years age group, it is found highest (24/1000) among SC and lowest (9/1000) among ST. It is notable that across the age, proportion of ailed person is highest among OBC followed by *Others* group and lowest among ST followed by SC people.

Among the aged people, PAP is found 140 per 1000 among ST to 338 per 1000 among *Others* group people in India. As the PAP, is very high among the aged people, figure 1 tried to examine PAP at single year age between 60-80 years. It is found that there is variation across the age above 60 years and among each social group. Across the age, the emerging pattern across each social group is same with highest PAP among SC between 74-78 years among SC people. The PAP among aged people is lowest among ST and highest among *Others* group. Another observation is that with the increasing age, the PAP is also increasing but not with consistent rate. As within the 60-64 years, it varied between 99/1000 (among ST) and 316/1000 (among *Others*); within age 65-69 years, it varied between 131/1000 (among ST) to 330/1000 (among Others), within 70-74 years, it found varied between 200/1000 (among ST) to 345/1000 (among SC). Above the 75-59 years, it found 118/1000 (among ST) to 374/1000 (among *Others*).

Figure 1: Proportion of Ailed Person of 60 years & Above across Social Group in India, 2014 (per 1000)



The PAP differential according to different socio-economic characteristics across the social groups is provided into Table 1B. Along the geographies, PAP is high of 86/1000 in urban areas compared to 52 in rural areas. There is no rural-urban difference among ST but more than 27 among SC, 18 among *Others* and high of 40 among OBC group. In rural areas the highest PAP is found among *Others* but in urban areas, it is high among OBC followed by *Others*. With increasing economic status, PAP for NCDs also found increasing. Like, it is 50 per 1000 among poorest quintile to 60 per 1000 among middle and 88 per 1000 among richest quintile. Among all the social groups, with the increasing economic status, PAP increases except for third/middle quintile. Further, within each quintile, PAP is lowest among ST and highest among the *Others* group. The occupational structure of household reveals that the households engaged in agriculture having lowest proportion of ailed person for NCDs and the salaried are having highest proportion of ailed persons. Causal labour households in both agriculture and non-agriculture having low of ailed person reported for any NCDs in last 15 days. With increasing education level, NCDs is found decreasing and the pattern is found consistent among all the social groups. Among Hindu and Muslim, proportion of ill person is found close to each other. However, there is difference among the religion line among each social group and can be understand from Table 1B.

Table 1B: Proportion of Ailed Person for Chronic Ailment by Social Group in India (per 1000)

	Social Group				India
	ST	**SC**	**OBC**	**Others**	
Place of residence					
Rural	27.9	49.5	51.7	70.1	52.6
Urban	28.9	76.5	91.1	88.5	85.9
MPCE Quintile					
First Quintile	25.9	53.3	51.1	67.1	51.0
Second Quintile	29.3	55.1	63.7	73.2	60.7
Middle Quintile	21.7	54.0	61.7	72.0	60.4
Fourth Quintile	38.5	57.3	69.2	86.8	71.9
Fifth Quintile	49.0	73.0	90.6	90.5	87.7
Education					
No Education	39.7	71.2	73.7	93.7	72.9
Primary	20.0	49.2	61.4	66.5	56.2
Secondary	20.0	44.7	60.3	79.2	60.4
Higher Secondary	23.0	27.5	41.2	59.8	45.7
Graduate+	10.8	48.7	51.3	87.7	68.5
Main Income Source					
self-employed in agriculture	30.3	36.3	39.1	62.7	43.7
self-employed in non-agriculture	37.4	58.7	69.5	72.1	67.8
salary earning	31.6	64.7	76.7	80.4	73.6
casual labour in agriculture	25.8	53.7	47.6	58.7	48.0
casual labour in non-agriculture	13.9	55.3	66.0	74.0	58.2
Other	58.4	117.6	161.9	186.9	160.4
Religion					
Hindu	28.8	54.1	59.5	80.6	60.6
Muslim	29.3	81.1	68.6	47.1	58.9
Christian	17.3	210.3	201.8	250.9	139.5
Rest	38.1	55.0	102.6	105.4	78.3
Total	28.0	55.5	63.2	78.0	62.6

Source: Authors' calculation using NSS data on Social Consumption on Health, 2014

Share of Non-Communicable Diseases and Social Groups Pattern

Table 2 provides evidences of share of different chronic illness among Indian people at aggregate and by social group also. Out of the total persons reported about episode of any non-communicable diseases in last 15 days, highest of 19 percent has suffered from muscular-skeletal illness followed by life style diseases mainly hypertension and diabetes, 17 percent each. Other illness are gastro-intestinal (11%), psychiatric & neurological (9%), respiratory (6%) and heart disease (5%). These seven non-communicable diseases are responsible for more than four-fifth (84%) of total NCDs in the country. Life threatening disease like cancer is reported by less than one percent people. Muscular-skeletal disease is reported high of 25 percent among ST to 18-19

percent among non-ST. Hypertension and diabetes is found highest among better off social group mainly *Others*, having 20 percent suffering from hypertension and 18 percent from diabetes. It is lowest of 8 percent among ST. Among SC and OBC people, it floated between 14-17 percent. Gastro-intestinal, psychiatric & neurological is found more prevalent among poorly developed marginalized social group ST and SC. 15 percent ST and 14 SC are suffering from gastro-intestinal diseases compared to 9 percent *Others*. Psychiatric & neurological problem is found 13 percent ST and 11 percent SC ill persons to only 7 percent ill *Others* group people. Respiratory problem is high of 7 percent among SC. Blood related disease, ear & eye problem found high among ST. Notably, cancer is high among SC (0.8%) compared to Others (0.5%). Overall, all the diseases are not equally and consistent among all the social groups.

Table 2: Share of different Ailment in total reported Ailed person by NCD across Social Groups in India (%)

Disease	**ST**	**SC**	**OBC**	**Others**	**India**
Musculo-Skeletal	25.5	19.1	18.5	18.4	18.9
Hypertension	7.8	13.7	16.7	19.6	16.8
Diabetes	9.5	13.5	17.7	17.9	16.8
Gastro-Intestinal	15.5	14.0	10.8	9.3	11.0
Psychiatric & Neurological	13.3	11.0	8.3	7.7	8.8
Respiratory	4.0	7.1	6.8	6.1	6.5
Heart Disease	4.7	4.7	5.4	5.8	5.4
Skin related	5.1	4.7	3.8	3.9	4.0
Endocrine-Metabolic-Nutritional	2.5	2.8	2.8	3.9	3.1
Genito-Urinary	2.1	3.1	4.1	2.0	3.1
Ophthalmic	3.1	3.2	2.3	2.1	2.4
Blood Disease	4.4	1.5	1.2	1.4	1.5
Ear Problem	2.1	1.0	0.9	1.3	1.1
Cancer	0.4	0.8	0.7	0.5	0.6
N (Estimated)	2909712	11713796	31353613	24183428	70160550

Source: Authors' calculation using NSS data on Social Consumption on Health, 2014

Prevalence of Chronic Illness among Indian Population and Social Distribution

The prevalence rate of the non-communicable diseases reported by households for their members in last 15 days for each social group is provided in Table 3. The prevalence rate is calculated on per 1000 population found 63 have been fallen ill due to any non-communicable diseases included into the study. It was 11 per 1000 for muscular-skeletal illness. In case of hypertension and diabetes each, it is 10 per 1000 persons. For gastro-intestinal, psychiatric & neurological, respiratory and hearth diseases it varied between 10 and 3 per 1000 person. For the social group, prevalence rate for NCDs varied from 28 among ST to 78 among *Others* group. Among ST, the prevalence rate for musculo-skeletal is found 7 per 1000, 4 per 1000, for gastro-intestinal and psychiatric & neurological it is 4 per 1000. Among the better off social group-*Others*, prevalence rate for hypertension (15/1000), musculo-skeletal (14/1000), diabetes (14/1000) is found to be high.

Other diseases like gastro-intestinal, psychiatric & neurological, respiratory and heart diseases also having prevalence rate of more than 4 persons per 1000. Prevalence rate of different diseases among OBC followed same pattern with high for musculo-skeletal (11/1000), hypertension (10/1000), diabetes (11/1000), to low for gastro-intestinal (7/1000), psychiatric & neurological (5/1000), respiratory (4/1000) and heart diseases (3/1000). Among SC prevalence rate is high for musculo-skeletal (11/1000), hypertension (7/1000), diabetes (7/1000), gastro-intestinal (8/1000) to low for psychiatric & neurological (6/1000), respiratory (4/1000) and heart diseases (3/1000). For other diseases, it can be understood from Table 3.

Table 3: Prevalence Rate of NCD by social groups in India (per 1000)

Disease	**ST**	**SC**	**OBC**	**Others**	**India**
Musculo-Skeletal	7.2	10.6	11.7	14.4	11.8
Hypertension	2.2	7.6	10.5	15.3	10.5
Diabetes	2.7	7.5	11.2	14.0	10.5
Gastro-Intestinal	4.3	7.8	6.8	7.2	6.9
Psychiatric & Neurological	3.7	6.1	5.3	6.0	5.5
Respiratory	1.1	3.9	4.3	4.8	4.1
Heart Disease	1.3	2.6	3.4	4.5	3.4
Skin related	1.4	2.6	2.4	3.0	2.5
Endocrine-Metabolic-Nutritional	0.7	1.5	1.7	3.1	2.0
Genito-Urinary	0.6	1.7	2.6	1.6	2.0
Ophthalmic	0.9	1.7	1.5	1.7	1.5
Blood Disease	1.2	0.9	0.7	1.1	0.9
Ear Problem	0.6	0.5	0.6	1.0	0.7
Cancer	0.1	0.4	0.4	0.4	0.4
All	**28.0**	**55.5**	**63.2**	**78.0**	**62.6**

Source: Authors' calculation using NSS data on Social Consumption on Health, 2014

Risk Factor of Non-Communicable Diseases in India

The risk factors of non-communicable diseases are calculated using odds ratio for demographic, socio-economic characteristics and state/UTs in India. Two models is employed to estimate the odds ratio, first model with unadjusted odds ratio and second adjusted on states/UTs. There are two different tables is provided, first for all NCDs (Table 4) and second for each NCD (Table 5), only for each of the social group. In table 4, two models is provided, first without adjusted for state/UTs and second adjusted for states/UTs. It is important to add here that except for the age of ill persons, state effect contributes to alter the risk of NCDs on all other selected predictors with lowering the relative risk (low odds ratio) with high significance level. In comparison to ST, the SC, OBC and *Others* are having odds ratio of more than double (2.15, $p<0.001$ for SC, 2.33, $p<0.001$ for OBC and 2.23, $p<0.01$ for *Others*). After adjusted on state, the odds ratio for SC reduced to 1.17, for OBC reduced to 1.19 and for Other reduced to 1.28 ($p<0.001$). The risk of NCDs are more in urban residents compared to rural one and slightly increases after adjusted for state in model 2. Age of ailed person revealed interesting results as even after adjusted on state, the odds ratio remained unchanged in both model. The risk of caught in NCDs increases with age and highest among person of age 60 years and above significantly. Significantly more female than male are having risk of NCDs and reduced slightly in model 2.

Less educated than the not educated have high odds ratio of 1.37 and 1.18 compared to not educated at all ($p<0.001$). However, the person who are graduate and above are having 13 percent less risk of NCDs than the not educated person and it reduce to more 4 percent after adjusted on state ($p<0.001$).

Table 4: Associated Risk Factors of NCD in last 15 days in India

	Model 1: Unadjusted				**Model 2: Adjusted[#]**			
	OR	**SL**	**LL**	**UL**	**OR**	**SL**	**LL**	**UL**
Social Groups: ST (Ref.)								
SC	2.15	0.001	2.00	2.32	1.17	0.001	1.08	1.27
OBC	2.33	0.001	2.18	2.50	1.19	0.001	1.10	1.28
Others	2.23	0.001	2.08	2.39	1.28	0.001	1.19	1.38
Sector : Rural (Ref.)								
Urban	1.11	0.001	1.07	1.15	1.14	0.000	1.10	1.19
Age Group: 60 & above (Ref.)								
0-14	0.03	0.001	0.02	0.03	0.03	0.001	0.03	0.03
15-29	0.05	0.001	0.05	0.05	0.05	0.001	0.05	0.06
30-44	0.14	0.001	0.14	0.15	0.15	0.001	0.14	0.16
45-59	0.42	0.001	0.41	0.44	0.42	0.001	0.41	0.44
Sex: Male (Ref.)								
Female	1.36	0.000	1.32	1.40	1.32	0.000	1.28	1.36
Level of Education: No Education (Ref.)								
Primary	1.37	0.001	1.32	1.43	1.24	0.001	1.19	1.29
Secondary	1.18	0.001	1.13	1.23	1.07	0.003	1.02	1.12
Higher Secondary	0.94	0.088	0.88	1.01	0.91	0.014	0.85	0.98
Graduate+	0.87	0.001	0.82	0.93	0.83	0.001	0.78	0.89
MPCE: First (Ref.)								
Second	1.12	0.001	1.06	1.18	0.99	0.680	0.94	1.04
Middle	1.16	0.001	1.10	1.21	1.04	0.107	0.99	1.09
Fourth	1.31	0.001	1.25	1.37	1.12	0.001	1.07	1.18
Fifth	1.48	0.001	1.41	1.55	1.28	0.001	1.21	1.34
Sources of Income: Agriculture (Ref.)								
Non-agriculture	1.35	0.001	1.28	1.42	1.20	0.001	1.14	1.26
Salary earning	1.53	0.001	1.45	1.61	1.28	0.001	1.21	1.36
Casual labour in agriculture	1.53	0.001	1.43	1.64	1.03	0.474	0.96	1.10
Casual labour in non-agriculture	1.65	0.001	1.56	1.75	1.18	0.001	1.11	1.26
Other	2.09	0.001	1.96	2.22	1.58	0.001	1.48	1.69
Religion: Hindu (Ref.)								
Muslim	1.11	0.001	1.06	1.16	1.05	0.049	1.00	1.10
Christian	1.34	0.001	1.25	1.44	1.13	0.003	1.04	1.23
Other	1.16	0.001	1.08	1.26	1.17	0.001	1.07	1.29
Constant	**0.08**	**0.000**	**0.08**	**0.09**	**0.12**	**0.000**	**0.10**	**0.14**

Adjusted for states/UTs; OR: Odds Ratio; SL: Significance Level; LL: Lower Limit; UL: Upper Limit.

The economic status increases the risk of NCDs and increases with increasing economic wellbeing. Like the 48 percent more richest having NCDs than the poorest (poorest=1.00, richest=1.48, p<0.001). Even after adjusting for state, 28 percent more richest compared to poorest have reported for NCDs. The main income source of the household and risk of NCDs among members is also tried to capture and found that the person from self-employed in agricultural households has having lowest risk of NCDs than the rest of income source. It is found 35 percent more for self employed in non-agriculture, 53 percent more for salaried, 53 percent more for casual labour in agriculture and highest of 65 percent more for casual labour in non-agricultural activities with high significance level. However, after adjusted on state, the decline in odds ratio is found highest for casual level in agriculture and non-agricultural activities (p<0.001). The odds ratio shows 34 percent and 11 percent more NCDs among Christian and Muslim compared to Hindu households. State adjustment show more decline for Christian than the Muslim on NCDs in the county.

Table 5: Odds Ratio of being ill in last 15 days for different illness among social group in India

Disease	**Unadjusted#**						**Adjusted#**					
	SC		**OBC**		***Others***		**SC**		**OBC**		***Others***	
	OR	**SL**	**OR**	**SL**	**OR**	**SL**	**OR**	**SL**	**OR**	**SL**	**OR**	**SL**
Hypertension	2.44	0.000	2.97	0.000	2.90	0.000	1.34	0.005	1.38	0.001	1.61	0.000
Diabetes	3.84	0.000	4.93	0.000	3.96	0.000	1.57	0.000	1.58	0.000	1.88	0.000
Heart Disease	1.97	0.000	2.32	0.000	2.41	0.000	1.14	0.381	1.26	0.101	1.44	0.010
Cancer	1.37	0.262	1.41	0.172	1.78	0.022	1.05	0.873	1.08	0.788	1.44	0.205
Blood Disease	0.88	0.571	0.94	0.741	1.11	0.617	0.67	0.080	0.71	0.095	0.87	0.525
Endocrine, Metabolic, Nutritional	5.45	0.000	5.19	0.000	4.90	0.000	1.70	0.049	1.62	0.065	1.57	0.086
Psychological-Neurological	1.44	0.000	1.36	0.000	1.29	0.005	1.13	0.214	1.08	0.426	1.04	0.685
Ophthalmic	1.52	0.034	1.39	0.067	1.65	0.007	0.98	0.930	0.97	0.857	1.07	0.734
Ear Related Problem	1.10	0.707	0.89	0.626	0.95	0.850	0.67	0.145	0.54	0.018	0.57	0.028
Respiratory	2.23	0.000	2.37	0.000	2.35	0.000	1.27	0.095	1.41	0.013	1.39	0.018
Gastro-Intestinal	1.81	0.000	1.70	0.000	1.83	0.000	1.31	0.011	1.35	0.003	1.30	0.009
Skin Related Problem	1.73	0.001	1.93	0.000	1.63	0.003	1.08	0.647	1.33	0.080	1.03	0.860
Musculo- Skeletal	1.60	0.000	1.59	0.000	1.74	0.000	1.01	0.894	1.00	0.981	1.10	0.227
Genito-Urinary	2.03	0.000	2.47	0.000	1.94	0.000	1.23	0.290	1.49	0.029	1.23	0.254

Note: OR: Odds Ratio; SL: Significance Level; Odds ratio of being suffered from different illness with reference to ST people; $: Unadjusted controlled on demographic characteristics Age and Sex, Socio-economic characteristics MPCE, income source, education, place of residence and religion of household head. #: Adjusted on states/UTs including the controlled characteristics.

In table 5, odds ratio for each of the NCD is presented for each social group in comparison to ST. Model 1 is controlled on demographic and socio-economic characteristics and model 2 adjusted on states including the characteristics controlled into model 1. Significantly, odds ratio of hypertension, diabetes, heath disease, respiratory and EMN related diseases among SC, OBC and *Others* is found more than twice compared to the ST. Like, for diabetes, the odds

ratio is 3.84 for SC, 4.93 for OBC and 3.96 for *Others* ($p<0.001$). For hypertension, the odds ratio is found 2.44, 2.97 and 2.90 for SC, OBC and *Others* respectively. For respiratory diseases, the odds ratio significantly varied between 2.23-2.37 for different social groups compared to the ST. For the other diseases group can be found in Table 5. It is also found that the adjusted odds ratio for each of the social group on state contribute significantly in reducing the risk of NCDs. After adjustment on state, the odds ratio for SC, OBC and Others for all the diseases reduced and float between odds ratio of 1.01-1.99 with the same significance level as of model 1.

Discussion

Globally, post- 90s, the burden of NCDs is on increase and more in developing countries than the developed countries. In the line, India is one of the country where NCDs are also on increase and social class affiliation also contribute differently on magnitude and prevalence of such diseases. Hence, this research study explores the social class/group wise prevalence of NCDs and share in total NCDs burden across the social group and associated risk factors in India. Study found that in 2014, only 37 percent were suffering from CDs as against of 59 percent from NCDs in the country. It is important finding that scheduled tribe is still suffering more from CDs than NCDs (56% from CDs and 40% from NCDs). Among SC, OBC and Others, the share of NCDs are found 56 percent, 59 percent and 63 percent respectively.

The study found that older adults, females and urban residents, not educated or having minimal education, the richest households, showed the higher prevalence rates of high NCDs across all the social groups in India. Among the aged people, prevalence rate among ST is found 140 per 1000 to 338 per 1000 among *Others* group people. Proportion of ailed person (PAP) for NCDs found 63 per 1000 in 2014 which varies from a low of 28 per 1000 among ST to high of 78 per 1000 among *Others* group. Among all the social groups, with the increasing economic status, prevalence of NCDs increases, however, within each quintile, PAP is lowest among ST and highest among the *Others* group.

The economic status increases the risk of NCDs and increases with increasing economic well being significantly. Households engaged in agriculture found lowest proportion of ailed person and the salaried are having highest proportion of ailed persons. Causal labour households in both agriculture and non-agriculture sector having high risk of NCDs. The findings are consistent with other study found that increasing burden of major NCDs are the result of working status and prevalence varying with their types of occupation (Patel et al., 2020). Education as a major developmental indicator and have been found strongly linked with the outcomes, study revealed that with increasing education level, NCDs is found decreasing and the pattern is found consistent across the social groups. Evidences revealed that people with lower educational attainment having increased risk of diabetes in India. The seven non-communicable diseases are responsible for more than four-fifth of total NCDs in the country and those are hypertension, diabetes, respiratory, heart disease, gastro-intestinal, and psychiatric & neurological other than other than the musculo-skeletal illness. In the post 80s, the Non-communicable diseases such as diabetes, cardiovascular diseases, gastrointestinal disorders, cancer, respiratory disease, and urogenital diseases are continuous on increase and needs attention (Habib & Saha, 2010). Other studies have also found that Indian people are much affected by diabetes and hypertension (Kinra et al. 2010; Corsi & Subramanian, 2012). Hypertension has been found to be more common among the socioeconomically privileged population. The first four are majorly responsible for

highest mortality due to NCDs across the globe, including India. One third of deaths occurred in India are due to major NCDs disease like, hypertension, diabetes, asthma and heart disease (IHME, 2017).

State level prevalence of NCDs in India found high in south Indian state mainly Kerala, Tamil Nadu, Andhra Pradesh; West Bengal in east and Punjab in North-west. Except for ST; Kerala was having highest prevalence for rest of the social groups in the country. India is experiencing double burden of diseases with remarkable transformation in the age pattern of morbidity and mortality, along with structural shift in disease patterns from communicable to non-communicable evidenced from the studies (James, 2011; Yadav and Arokiasamy, 2014). The high burden of NCD in Kerala and other south Indian states is witnessed due to increasing proportion of aged population. It is important to add here that except for the age of ill person, state effect contribute to alter the risk of NCDs on all other selected predictors with lowering the relative risk (low odds ratio) with high significance level. In comparison to ST, the SC, OBC and *Others* found having odds ratio of more than twice which reduced to a low of 1.09-1.28, seems state level socio-economic development and demographic structure having great impact on prevalence of non-communicable diseases in India. Because all the states not having physical proximity and similar levels of development and epidemiological transition (ICMR, 2017).

Conclusion

Overall, India is experiencing a sharp rise in the burden of non-communicable diseases and same is found across the social group with differential proportion across the state. Except for the ST, share of NCDs are found highest among all the social groups and findings are consistent with few available studies on the social group in the country (Prasad & Raushan, 2019). Hypertension, diabetes, respiratory and heart disease along with psychiatric & neurological and musculo-skeletal diseases are the most common NCDs found among all social groups. The aged, being female, having no education and engaged in sedentary occupation increases the risk of NCDs among people. The state having older population is having more burden of NCDs even after adjusted on state didn't alter the relative risk of NCDs among different age group. Kerala, Andhra Pradesh, West Bengal, Punjab having very high burden of NCDs needs state specific policy to combat the burden of NCDs, however Kerala is doing better in this regard. The more developed social groups are having high burden of NCDs than the less developed social groups. Among ST, still burden is more of CDs but the SC who are close to ST on developmental parameters but found bearing more burden of NCDs needs attention.

Overall, the study have strength to represents the NCDs burden across the states and among the social group in the county having worth for future group specific policy preparation to combat life threatening NCDs in India. However, the study is also having some limitations. Generally, studies on morbidity struggled on the measurement issues such as definitional problem, choice of reference period, recall bias and the perception and cultural influences as well as data collection methodology which affect the reporting of morbidity (Murray and Chen, 1992; Gumber and Berman, 1998; Duraisamy, 2001, Rauhshan and Mutharayappa, 2014), can be one of the limitations of the study. The perceiveness and recognition as a human behaviour compounded by economic status and knowledge and awareness also plays important role in reporting any ailments as morbidity (Murray and Chen, 1992). Studies based on self-reported

acute and chronic morbidity having other limitations. As SC and ST is socio-economically poor and restricted with cultural traits may perceive any illness differently from other social groups and this may be one reason of under reporting of any ailments as morbidity and seeking treatment The evidences are in line of the previous studies (Murray and Chen, 1992; Nayar, 2007; Raushan and Mutharayappa; Raushan and Acharya, 2018). Third the study is based on 15 days reference period may also limit the actual prevalence of any illnesses. Overall, the study provided a snapshot of the social group pattern of NCDs in India needs more studies along the social group line and especially for the poorly developed social groups.

References

Boutayeb, A. and Boutayeb, S., 2005, The burden of non communicable diseases in developing countries. *International journal for equity in health*, *4*(1): 2.

Corsi, D.J. and Subramanian, S.V., 2012, Association between socioeconomic status and self-reported diabetes in India: a cross-sectional multilevel analysis. *BMJ open*, *2*(4): 1-12.

Duran, A. and Khot, A., 2011, Strengthening the health system to better confront noncommunicable diseases in India. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, *36* (Suppl1), p.S32.

Duraisamy, P., 2001, *Health status and curative health care in rural India*. National Council of Applied Economic Research.

Engelau, M.M., El-Saharty, S. and Kudesai, P., 2011, Capitalizing on the demographic transition: Tackling noncommunicable disease in South Asia.

Gumber, A. and Berman, P., 1998, Measurement and pattern of morbidity and the utilization of health services: some emerging issues from recent health interview survey in India. *Journal of Health and Population*, *1:*16-43.

Habib, S.H. and Saha, S., 2010, Burden of non-communicable disease: global overview. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *4*(1): 41-47.

ICMR, P.I., PHFI and IHME, 2017, India: health of the nation's states: the india state-level disease burden initiative. *New Delhi, India*.

James, K.S., 2011, India's demographic change: opportunities and challenges. *Science*, *333*(6042): 576-580.

Kinra, S., Bowen, L.J., Lyngdoh, T., Prabhakaran, D., Reddy, K.S., Ramakrishnan, L., Gupta, R., Bharathi, A.V., Vaz, M., Kurpad, A.V. and Smith, G.D., 2010, Sociodemographic patterning of non-communicable disease risk factors in rural India: a cross sectional study. *Bmj*, *341*, p.c4974.

MOSPI, 2016, India- Social Consumption: Health, National Sample Survey Office - M/o Statistics and Programme Implementation (MoSPI), Government of India (GOI).

Murray, C.J. and Chen, L.C., 1992, Understanding morbidity change. *The Population and Development Review*, pp.481-503

Nayar, K.R., 2007. Social exclusion, caste & health: a review based on the social determinants framework. *Indian Journal of Medical Research*, *126*(4): 355.

NHP, 2019. Central Bureau of Health Intelligence Directorate General of Health Services Ministry of Health & Family Welfare, Government of India.

Omram, A.R., 2001. The epidemiologic transition: a theory of the epidemiology of population change. *Bulletin of the World Health Organization*, *79:* 161-170.

Panda, R., Mahapatra, S. and Persai, D., 2018, Health system preparedness in noncommunicable diseases: findings from two states Odisha and Kerala in India. *Journal of family medicine and primary care*, *7*(3): 565.

Patel, S., Ram, U., Ram, F. and Patel, S.K., 2020, Socioeconomic and demographic predictors of high blood pressure, diabetes, asthma and heart disease among adults engaged in various occupations: evidence from India. *Journal of biosocial science*, *52*(5): 629-649.

Prasad, S. and Raushan, R., Treatment Seeking Behaviour and Challenges in Availing Services Across Social Groups in India. *Population and Sustainable Development*, p.133. *: http://shyaminstitute.in/*

Raushan, R. and Mutharayappa, R., 2014, Social disparity in child morbidity and curative care: Investigating for determining factors from rural India. Institute for Social and Economic Change. http://www.isec.ac.in/WP%20314%20-%20Rajesh%20and%20Mutharayappa_Final.pdf

Raushan, R. and Mutharayappa, R., 2014, Social disparity in curative care: Determining factors across social groups in rural India. *Journal of Social and Economic Development*, *16*(2): 204-225.

Raushan, R. and Acharya, S.S., 2018, Morbidity and Treatment-seeking Behaviour Among Scheduled Tribe in India: A Cross-sectional Study. *Journal of Social Inclusion Studies*, *4*(2): 325-340

Raushan, R. and Prasad, S., 2017, Social Disparity in Morbidity and Treatment Seeking Behaviour: A Macro-Level Study. *Journal of Social Inclusion Studies, 3*(1-2): 65-81.

World Health Organization, 2003. *Social determinants of health: the solid facts*. World Health Organization. Regional Office for Europe. https://www.euro.who.int/__data/assets/pdf_file/0005/98438/e81384.pdf

World Health Organization, 2013, Global action plan for the prevention and control of noncommunicable diseases 2013-2020.

http://apps.who.int/iris/ bitstream/10665/94384/1/9789241506236_eng.pdf?ua=1

World Health Organization, 2015, Non-communicable diseases progress monitor 2015 https://www.who.int/nmh/publications/ncd-progress-monitor-2015/en/

World Health Organization, 2020, *World health statistics 2016: monitoring health for the SDGs sustainable development goals*. World Health Organization. https://apps.who.int/iris/handle/10665/332070

Yadav, S. and Arokiasamy, P., 2014, Understanding epidemiological transition in India. *Global health action*, *7*(1): 23248.

Appendix

Table A1: Classification and grouping of ailments into NCDs

NCD Group	Code	Ailment nature and type
DIABETES	16	Diabetes
HYPERTENSION	34	Hypertension
HEART DISEASE	35	Heart Disease
CANCER	13	CANCERS (known or suspected by a physician)
BLOOD DISEASES	14	Anemia (any cause)
	15	Bleeding disorders
ENDOCRINE, METABOLIC, NUTRITIONAL	17	Under-nutrition
	18	Goitre and other diseases of the thyroid
	19	Others (including obesity)
PSYCHIATRIC & NEUROLOGICAL	20	Mental retardation
	21	Mental disorders
	22	Headache
	23	Seizures or known epilepsy
	24	Weakness in limb muscles and difficulty in movements
	25	Stroke/ hemiplegia/ sudden onset weakness or loss of speech in half of body
	26	Others including memory loss, confusion
EYES PROBLEM	27	Discomfort/pain in the eye with redness or swellings/ boils
	28	Cataract
	29	GLAUCOMA
	30	Decreased vision (chronic) NOT including where decreased vision is corrected with glasses
	31	Others (including disorders of eye movements – strabismus, nystagmus, ptosis and adnexa)
EAR PROBLEM	32	Earache with discharge/bleeding from ear/ infections
	33	Decreased hearing or loss of hearing
RESPIRATORY	38	Bronchial asthma/ recurrent episode of wheezing and breathlessness with
GASTRO-INTESTINAL	39	Diseases of mouth/teeth/gums
	40	Pain in abdomen: Gastric and peptic ulcers/ acid reflux/ acute abdomen
	41	Lump or fluid in abdomen or scrotum
	42	Gastrointestinal bleeding
SKIN PROBLEM	43	Skin infection (boil, abscess, itching) and other skin disease
MUSCULO-SKELETAL	44	Joint or bone disease/ pain or swelling in any of the joints, or swelling or pus from the bones
	45	Back or body aches
GENITO-URINARY	46	Any difficulty or abnormality in urination
	47	Pain the pelvic region/reproductive tract infection/ Pain in male genital area
	48	Change/irregularity in menstrual cycle or excessive bleeding/pain during menstruation